



Natural Resources Conservation Service
CONSERVATION PRACTICE STANDARD
RESIDUE AND TILLAGE MANAGEMENT, REDUCED TILL
CODE 345

(ac)

DEFINITION

Managing the amount, orientation, and distribution of crop and other plant residue on the soil surface year-round while limiting soil-disturbing activities used to grow and harvest crops in systems where the field surface is tilled prior to planting.

PURPOSE

This practice is used to accomplish one or more of the following purposes:

- Reduce sheet, rill, and wind erosion and excessive sediment in surface waters
- Reduce tillage-induced particulate emissions
- Improve soil health by maintaining soil organic matter quantity
- Improve soil health by maintaining soil aggregate stability
- Improve soil health by maintaining habitat for soil organisms
- Reduce energy use

CONDITIONS WHERE PRACTICE APPLIES

This practice applies to all cropland.

CRITERIA

General Criteria Applicable to All Purposes

This practice includes tillage methods commonly referred to as mulch tillage or conservation tillage where the entire soil surface may be disturbed by tillage operations such as chisel plowing, field cultivating, tandem disking, or vertical tillage. It also includes tillage and/or planting systems with few tillage operations (e.g., ridge till), but which do not meet the soil tillage intensity rating (STIR) criteria for NRCS Conservation Practice Standard (CPS) Residue and Tillage Management, No-Till (Code 329).

Uniformly distribute residues over the entire field. Removing residue from the row area prior to or as part of the planting operation is acceptable.

Do not burn residues, except for a light-to-moderate burn of sugarcane residue after harvest (as described in the wind and water erosion operations database).

The STIR value includes all soil disturbance field operations that are performed during the crop interval (i.e., from the time immediately following harvest or termination of one production crop through harvest or termination of the next production crop in the rotation, including fallow periods). The crop interval STIR value rating must be no greater than 80, and no primary inversion tillage implements (e.g., moldboard plow) can be used.

Additional Criteria to Reduce Sheet, Rill, and Wind Erosion, and Excessive Sediment in Surface Waters

Select tillage equipment that leaves sufficient quantities of aboveground residue during the periods with the highest erosion rates, which in conjunction with other practices in the management system, reduce erosion to the planned soil loss objective.

Use the current NRCS erosion prediction technology to document and determine the type and intensity of field operations allowed to achieve the amount of randomly distributed surface residue needed at the time of year residue needs to be present in the field to reduce erosion to the desired level. In addition, for wind erosion, determine the required height of standing residue following harvest, how long it needs to be maintained, and the row direction and ridge height needed to reduce erosion to the desired level. Calculations must account for the effects of other practices in the management system.

In ridge till systems, plan ridge height and ridge orientation to manage runoff and minimize erosion, with a maximum row grade not to exceed 4 percent.

Additional Criteria to Reduce Tillage-Induced Particulate Emissions

Reduce or modify tillage operations that create dust, especially during critical air quality periods.

Additional Criteria to Maintain Soil Organic Matter Quantity

To maintain organic matter quantity, ensure the soil conditioning index (SCI) for the cropping system is positive. The crop interval STIR value must be no greater than 50.

Additional Criteria to Maintain Soil Aggregate Stability and Habitat for Soil Organisms

Ensure adequate protection of soil aggregates and habitat for soil organisms by managing the amount, orientation, and distribution of residue or crop canopy to maintain a minimum of 50 percent cover throughout the year. Include diverse crop and plant types adapted to the region and practical for the rotation. The crop interval STIR value must be no greater than 50.

Additional Criteria to Reduce Energy Use

Reduce the total energy (fuel) consumption associated with field operations by at least 25 percent compared to the current (benchmark) condition. Use the current approved NRCS tool for determining energy use to document energy (fuel) use reductions.

CONSIDERATIONS

General Considerations

Removal of crop residue, such as by baling or grazing, can have a negative impact on resources. These activities should not be performed without full evaluation of impacts on soil, water, animal, plant, and air resources.

Reduced till may be practiced continuously throughout the crop sequence or may be managed as part of a residue management system that includes other tillage methods such as no till.

Production of adequate amounts of crop residue necessary for the proper functioning of this practice can be enhanced by selection of high residue-producing crops and crop varieties in the rotation, use of cover crops, and adjustment of plant populations and row spacing.

When used in combination with NRCS CPSs Stripcropping (Code 585) or Cover Crop (Code 340), the crop sequence should be consistent with the stripcropping design.

Soil compaction can be reduced by adjusting crop rotations to include deep-rooting crops with deep roots that extend to and penetrate compacted soil layers.

When providing technical assistance to organic producers, ensure residue and tillage management activities are consistent with the USDA Agricultural Marketing Service National Organic Program regulations.

Considerations to Improve Soil Health

The effects of this practice are enhanced when it is integrated into a soil health management system. Refer to NRCS Soil Health Technical Note No. 4 (Title 450), “The Basics of Addressing Resource Concerns with Conservation Practices within Soil Health Management Systems on Cropland” for more information.

Carbon loss is directly related to the volume of soil disturbed, intensity of the disturbance, and the soil moisture content and soil temperature at the time the disturbance occurs. To make this practice more effective at reducing carbon loss—

- Perform any deep soil disturbance, such as subsoiling or fertilizer injection, so the vertical slot created by the implements is closed at the surface.
- Plant with a single disk or slot opener no till drill to release less carbon dioxide (CO₂) and reduce oxidation of organic matter compared to wide-point hoe and chisel opener seeder drill.
- Perform soil disturbance when soil temperatures are below 50° F to oxidize less organic matter and release less CO₂ than operations performed when the soil is warmer.
- Maximize year-round coverage of the soil with living vegetation and/or crop residues to build organic matter and reduce soil temperature, thereby slowing organic matter oxidation.
- Use a diverse crop rotation by incorporating multiple crop types (cool-season grass, cool-season legume or forb, warm-season grass, warm-season legume or forb) into the crop rotation.
- Plant a cover crop after every production crop in the rotation. Multispecies cover crop mixes provide greater benefits than single-specie cover crops.
- Use undercutting tools rather than burying tools to enhance accumulation of organic material in the surface layer.

Considerations to Improve Wildlife

Crop residues may be a valuable food source for wintering wildlife where winter browse is sparse. Avoid fall shredding or tillage to maximize the amount of wildlife food and cover during critical winter months. Leaving ample stalk height when harvesting allows soil to dry and provides more cover for wildlife than chopping, shredding, or baling residue.

Leaving several rows unharvested around the edges of the field or planting borders of various forbs provides protection and food for overwintering wildlife and for beneficial insects and pollinators. Leaving unharvested crop rows for two growing seasons further enhances the value of these areas for wildlife. Avoid tillage and other soil-, residue-, and stubble-disturbing operations during the nesting season and brood-rearing period for ground-nesting species.

Careful consideration should be given to pesticides applied to crops raised for wildlife, particularly if nesting habitat or pollinator and biocontrol forage species are present. When applying agrichemicals, consider the potential impact on the soil organisms and consult with a pesticide professional to develop alternative application techniques or alternative agrichemicals that have lower adverse impacts on soil organisms.

Use an approved habitat evaluation procedure to determine the appropriate time and amount of residue and stubble needed to provide adequate food and cover for target wildlife species.

PLANS AND SPECIFICATIONS

Develop plans and specifications for each field or treatment unit according to the criteria requirements above and operation and maintenance requirements below. Specifications must describe the

requirements to apply this practice to achieve the intended purpose. Record the following specification components in an approved NRCS CPS Tillage and Residue Management, Reduced Till (Code 345) implementation requirements document:

- Purpose for applying the practice
- Planned crop(s) and acres
- Amount of residue produced by each crop either measured or estimated using erosion tools
- Orientation of the residue (i.e., standing, flat)
- List of all field operations or activities that affect—
 - Residue orientation.
 - Surface disturbance.
 - Amount of residue (pounds/acre or percent surface cover) required to accomplish the purpose, and the time of year it must be present.
- Planned STIR value, SCI value, and erosion rate for the crop interval
- Benchmark and planned energy consumptions

OPERATION AND MAINTENANCE

Evaluate and/or measure the crop residue cover and orientation for each crop to ensure the planned amounts and orientation are being achieved. Adjust tillage, planting, and harvesting operations as needed to achieve the planned purposes.

If there are areas of heavy residue accumulation because of movement by water or wind, spread residue prior to planting so it does not interfere with planter operation.

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